## Plague Prevention Measures.

**Order No. G. 18690-706—San. 92-18-16, dated 14th February 1920.**

The Government of His Highness the Maharaja have had, under their consideration, for some time past the question of improving the existing arrangements for combating the epidemic of plague in the State. To this end Dr. M. Srinivasa Rao, the late Sanitary Commissioner, submitted, on the eve of his retirement, a note in which he has reviewed the situation from the first out-break of the disease in Mysore twenty-one years ago and offered some useful suggestions for the future conduct of anti-plague operations. Government have also had the advantage of perusing the valuable Memorandum of the Sanitary Commissioner with the Government of India on Plague Preventive Measures, issued some time back. Before dealing with these suggestions, it is necessary to take a retrospect of the extent to which the State has suffered from the ravages of plague and of the expedients adopted to minimise the same.

2. The first case of plague, definitely diagnosed as such, occurred in the Bangalore City on the 12th August 1898 and the disease rapidly assumed an epidemic form, affecting not only the entire district of Bangalore but also the adjoining districts of Kolar, Tumkur and Mysore. Since then, these and other parts of the State, with occasional exceptions, have been subject to annual visitation of the epidemic, usually between May and October, the outbreak having been severest in the years 1902, 1903 and 1904 with 26,301, 20,223 and 21,622 deaths respectively. The total number of plague attacks, during the 20 years ending with June 1918, was 273,084 and the total number of deaths 199,840.

3. Plague extorts a considerably heavier toll of the urban than of the rural population. The absence of adequate facilities for prompt evacuation, the greater density of population and the large grain marts in cities and towns, favourable to the quick dissemination of infection through rats, appear to account for this fact. Atmospheric conditions also seem to have an intimate bearing upon the prevalence of plague. Dr. Srinivasa Rao states that a mean temperature between 70° and 80° Fahrenheit, associated with a "saturation deficiency" less than 0·30 inch is highly favourable for the out-break and spread of the epidemic, and that when the mean temperature rises above 80° F. with a high "saturation deficiency", the epidemic rapidly subsides.

4. The measures adopted in the beginning to check the spread of the disease were the following:—

(1) Detention and observation of persons coming from infected areas and disinfection of their luggage.
(2) Compulsory removal of plague patients to special hospitals.
(3) Compulsory isolation of persons that came into contact with plague patients.
(4) Disinfection of infected houses
and (5) Inoculation of persons exposed to infection, with the plague vaccine.

The first three measures, which were adopted in accordance with the theory of the means of dissemination of plague infection current at the time, were abandoned after a short trial, as the people, panic-stricken in the presence of a new danger, were unprepared for such interference.

5. Plague is now known to be a disease of rats caused by the plague bacillus which is spread from rat to rat and from rat to man by the bite of the rat flea. Rats being thus the medium of infection, anti-rat measures are of first importance in any anti-plague campaign, as they strike at the root of the evil. The decreased virulence of the disease in the second of the two decades under review is explained by Dr. Srinivasa Rao as possibly due to the rats having acquired great immunity to the attacks of the plague bacillus and he is of opinion that when the susceptible rats are killed off the surviving animals are able to transmit their acquired and inherited immunity to their young ones, an immunity which is strengthened in each succeeding generation so that there must ultimately arise a race of rats which are practically proof against plague. But he adds that it must not be forgotten that the plague bacilli may develop an increased virulence so as to attack even immunised rats. Apart from theory, there can be no question that the real anti-plague measure is the dissociation of man from rats. This can be effected with any degree

of success only through the exertions of the people themselves and a Memorandum has accordingly been issued inviting the attention of the public to the importance of the destruction of rats in their houses. Neither the Government nor the local bodies can do much in this direction and in fact the results of the attempts made at great expense by the Bangalore City Municipality for several years prior to 1911 to encourage the destruction of rats by offers of reward were inappreciable. It has been suggested that anti-rat compaigns can be carried on with most chance of success in the hot dry months of the off-plague season by the use of rat traps and rat poisons and that efforts should also be made at the same time to lessen food and shelter for rats. Barium carbonate has been recommended as a very effective rat poison and the directions for using it for this purpose, as given in the Memorandum of the Sanitary Commissioner with the Government of India, are reproduced below for the information of the public:—

"One pound of powdered native barium carbonate is mixed thoroughly in an enamelled basin with three pounds of flour made from the grain which constitutes the staple food of the locality in which operations are to be carried out. Sufficient water is added to make the whole into a fairly firm paste. The resulting mass is sufficient for some 2,400 baits, each containing three grains of poison, which are conveniently rolled into pill form. Clean hands and dishes are necessary to avoid imparting to the baits extraneous taste and odour which may diminish their attractiveness. Baits should be made fresh each day as hard stale bait is rarely eaten by rat."

"Poison baits made in the manner described should be laid in the evening, four baits on a small piece of paper being placed in situations readily accessible to rats but not so readily accessible to children and domestic animals. Twelve baits, three groups, will be found generally sufficient for an average sized Indian room. A careful record of the baits set should be kept and in the morning all unconsumed baits should be collected and destroyed, note being made of the number consumed wholly or in part and the dead rats found should be counted and destroyed. This process can be repeated daily until no more baits are consumed. Another baiting of the village or town can be carried out some two weeks later. When baiting is being carried out, special efforts should be made to encourage house-holders to keep all other available food for rat covered up especially at night. In laying baits, the presence of rat holes or other indications of the presence of rats will afford useful indications as to where baits can be laid with most chance of success."

"If rat poisoning be carried out with careful attention to all these details, a very notable degree of success will be achieved with very appreciable benefit when plague threatens."

6. As regards the action to be taken by public authorities in this matter, Government expect every large Municipality to frame suitable bye-laws for insisting upon houses, shops, godowns and markets being rendered rat-proof and, what is more important still, kept in a rat-free condition. The Sanitary Commissioner with the Government of India lays special stress on the importance of controlling the grain trade in this connection, as plague is generally found to begin in places in the close vicinity of markets and grain stores, in consequence of the transport of rats from infected localities for which grain and similar merchandise offer facilities. To counteract the dissemination of infection through this means, the same authority suggests the following as the *desiderata* of grain stores:—

"(1) Wherever possible, the whole-sale storage of grain should be effected in buildings apart from those in which retail trade is carried on.

(2) Wholesale grain stores should not be situated in close proximity to densely-crowded areas of a city.

(3) Whole-sale grain stores should never be utilised for purposes of human habitation.

(4) Bearing in mind that water is essential for the life of the rat, no water accessible to rats, or fresh vegetables should be allowed in wholesale grain stores.

(5) As rats are unable to circumvent a smooth horizontal projection of nine inches, such a ledge surrounding a grain store on the top of a plinth 3 feet high is effective in prohibiting the ingress of rats. On the sides of the building in which the doors are situated, this ledge can conveniently be enlarged into a platform 2 feet or 2 feet 6 inches in width. Re-inforced concrete is a suitable material for such ledges and platforms.

(6) The roof of the godowns should overhang this platform and ledge to prevent the accumulation of rain water therein.

(7) No steps or similar means of facilitating ingress should be allowed. In practice, the inconvenience caused by the absence of such steps will be found inconsiderable. For unloading sacks of grain designed for such a store, the bullock cart can be pushed close to the platform, which is also at a convenient height to facilitate the deposit therein of sacks from a cooly's back.

(8) Rats will, from time to time, be introduced into such a store, but they will be compelled to leave in search of water and should find their return extremely difficult.

(9) In villages and places where the cost of such *pucca* buildings is prohibitive, relatively rat-free stores can be made of almost any material provided the roof is water-tight, by raising the floor on uprights surmounted by rat-guards similar in design to those commonly employed on ship's cables. These uprights should be at least 3 feet high and would support the beams on which the floor rests. The floor might be made of wood. The space underneath the floor can be left open and kept free from weeds and rank-growth with but little trouble."

Government desire that, in places which are important grain centres, the Municipal Councils concerned should take action to control the grain trade on these lines.

The Railway Goods Sheds should similarly be kept free from rat infestation. The Agent, Mysore Railways, is requested to take suitable steps to secure this result.

7. While the anti-rat campaign, outlined in the preceding paragraph, is intended to prevent the outbreak of plague in a plague-threatened area, other measures have to be resorted to to check the spread of the epidemic when it has actually broken out. The measures now in vogue are evacuation and disinfection of infected dwellings and inoculation with the plague vaccine of persons exposed to infection. Though these measures have been employed in the past with no small success, there is still room for improvement in their actual working so as to render them more effective.

8. If evacuation is to secure the desired result, it should be both thorough and timely. The infected house should be vacated as soon as the infection is discovered and everything in the house should be removed to facilitate thorough disinfection as well as to prevent further rat infestation which cannot be avoided so long as there is any article in the house that would afford shelter or sustenance to rats. It is also important that the house should not be visited again on any account until it has been properly disinfected. No evacuated house should be re-occupied within two months and the re-occupation should be preceded by desiccation, lime white washing and the general tidying up of the house and its surroundings.

Government trust that the people will avail themselves of the facilities usually provided for evacuation, *viz.*, supply of bamboos from the Forest Department free to the poor and at cost price to others in villages where hutting materials are not easily available.

To facilitate prompt evacuation, arrangements should be made in every Municipality for the construction of sheds according to approved designs, the number of such sheds depending upon the population of the Municipality and the frequency and extent of prevalence of the epidemic. Approved type designs have been forwarded with estimates to the Presidents of the District Boards and Municipal Councils.

The sheds should be substantially built and properly looked after to prevent deterioration.

The Deputy Commissioners, in consultation with the Sanitary Commissioner, are requested to select suitable sites for camping grounds in towns and important villages and arrange for water-supply, etc.

9. Various methods of disinfection were practised, disinfection of soil by various kinds of chemical disinfectants such as corrosive sublimate, phenyle and its congeners, disinfection by emulsion of kerosine oil or pesterine in soap solution and

disinfection by heat and fumigation by burning *neem* leaves. Disinfection by dessication in a simple form has been advocated during the past two years and should be carefully carried out immediately after the evacuation of the house and repeated once again before re-occupation if the house has been vacant for more than ten days. All grains liable to infection should be exposed to bright sun-light for at least a couple of hours.

10. Inoculation has been slowly making its way against much opposition and this work is now carried on by medical and sanitary officers. In Bangalore, a Lady Assistant Surgeon is deputed for inoculating gosha ladies. To obtain full benefit from inoculation, it should be resorted to when the epidemic is in its incipient stage instead of when it is at its height as is the tendency at present. The following statement gives the number of people inoculated during the past five years and the incidence of plague mortality amongst them:—

| Period | Number of persons inoculated | Attacks among inoculated | Deaths among inoculated | Total attacks | Total deaths |
|---|---|---|---|---|---|
| 1913-14 ... ... ... | 9,473 | 15 | ... | 4,788 | 3,322 |
| 1914-15 ... ... ... | 21,308 | 13 | 2 | 7,021 | 4,789 |
| 1915-16 ... ... ... | 23,405 | 6 | 4 | 5,466 | 3,808 |
| 1916-17 ... ... ... | 93,931 | 51 | 20 | 16,552 | 11,755 |
| 1917-18 ... ... ... | 49,799 | 8 | 4 | 13,955 | 9,859 |

11. There are at present three plague hospitals in the State, one at Bangalore another at Mysore and the third at the Kolar Gold Fields. The number of patients admitted into these institutions during the past five years were:—

| | Bangalore | Mysore | Kolar Gold Fields |
|---|---|---|---|
| 1913-14 ... ... ... ... | 52 | 19 | 70 |
| 1914-15 ... ... ... ... | 175 | 131 | 206 |
| 1915-16 ... ... ... ... | 17 | 7 | 8 |
| 1916-17 ... ... ... ... | 343 | 48 | 329 |
| 1917-18 ... ... ... ... | 128 | 13 | 3 |

Government have under active consideration proposals for making these institutions more useful. The construction of a new Epidemic Diseases Hospital in Bangalore is also under the consideration of Government.

Other municipal towns with a population of 5,000 and upwards should have a small isolation hospital in charge of the local medical officer, with about half a dozen beds, located as close to the dispensary as possible. The isolation wards should be furnished with cots, bedding, clothing and other equipment.

12. The total expenditure incurred from 1896-97 up to 1917-18 on account of plague preventive measures according to the Comptroller's account is Rs. 29,29,804.

| Amount spent from | Rs. |
|---|---|
| State funds ... ... ... ... | ... 26,30,249 |
| Municipal funds ... ... ... ... | ... 2,51,556 |
| District funds ... ... ... ... | ... 29,106 |
| Sanitary Board, Kolar Gold Fields ... ... ... | ... 18,893 |
| Total | ... 29,29,804 |

Amildars and Deputy Amildars are provided with a permanent advance of Rs. 50 for expenditure under epidemic charges, the advance being recouped from time to time.

The municipalities have been asked to make a provision of Rs. 1,000 for every 10,000 of population, for epidemic charges in their budgets.

In case of the available grant in the budget being found inadequate, the Municipal Councils may apply to Government for special grant-in-aid through the Sanitary Commissioner.

The Municipal Councils of Bangalore and Mysore Cities are given half their expenditure on epidemics from State Funds.

The Sanitary Commissioner is requested to submit to Government, at an early date, in consultation with the officers and local bodies concerned, a detailed statement showing the distribution of expenditure (out of the State grants and contributions for plague and other epidemic charges) for plague prevention, disinfection and inoculation by

(1) the Public Health Department, and
(2) the Municipalities and District Boards.

He should also submit to Government a forecast of the expenditure to be incurred both during 1920-21 and for the next five years.

13. The only permanent or quasi-permanent establishment on any considerable scale maintained throughout the year partly from plague and partly from municipal funds is that for disinfection for the two cities and for the special work in connection with the frontier plague protection scheme in the districts.

Small establishments for varying temporary periods are entertained whenever necessary for attending on plague patients, for disinfection of houses, etc. The Deputy Commissioners have been authorised to incur an expenditure of Rs. 50 per mensem for temporary establishment for disinfection work.

To ensure that disinfection is effectively carried out, it is desirable to entrust this work to a trained staff. For this purpose, a few men attached to the permanent conservancy staff in each place should be trained in the technique of disinfection so that they may be employed on disinfection work whenever necessary, their places being taken temporarily by men to be newly engaged. Similar training should be given through Sanitary Inspectors to a few village servants in all important villages. When the number of affected villages is large, an itinerant gang may also be temporarily employed to practically demonstrate the method of disinfection to the villages under the supervision of the Sanitary Inspectors. These arrangements will obviate the necessity of maintaining a disinfection establishment throughout the year.

14. His Highness' Government desire that the measures herein recommended should be popularised by means of lectures and pamphlets and they trust that with the Local Self-Government Scheme and the re-organization of the Sanitary Department already sanctioned, the adoption of these measures will be facilitated. The Presidents of the Bangalore and the Mysore City Municipalities and the Deputy Commissioners of Districts are requested to submit at an early date detailed proposals for giving effect to these recommendations.

C. S. BALASUNDARAM IYER,
*Chief Secretary to Government.*

To—The Sanitary Commissioner.
The Deputy Commissioners of Districts.
The Presidents of the City Municipal Councils of Bangalore and Mysore.
The President, Kolar Gold Field Sanitary Board.
The Agent, Mysore Railways.
The Comptroller.
The Senior Surgeon.
The Conservator of Forests.
PRESS TABLE.

## Grant of Grain Compensation Allowance.

READ—

Government Order No. Fl. 100-149—G. F. 5-18-1, dated the 9th July 1918, sanctioning rules for the grant of grain compensation as per scale given in Article 72, Civil Account Code, Volume I, ragi being considered as the staple food grain and the taluk the unit.

2. Government Order No. Fl. 2047-96—G. F. 5-18-29, dated the 23rd October 1918, sanctioning rules for the grant of compensation for dearness irrespective of the price of any particular grain or commodity in the two cities of Bangalore and Mysore.